## WHAT IS CLAIMED IS:

1. A catalyst comprising a complex having formula I:

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 $R^{4}$   $R^{5}$   $R^{6}$   $R^{1}$  N  $R^{1}$  N  $R^{2}$ 

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1415

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where

M is a metal selected from Groups 3 to 10 of the Periodic

Table;

 $R^1$  and  $R^2$  are the same or different and are independently selected from hydrogen,  $C_{1-10}$  alkyl,  $C_{6-10}$  aryl, or  $C_{7-15}$  aralkyl, each of these optionally substituted with halogen, cyano,  $C_{1-4}$  alkoxy, or  $C_{1-4}$  alkyl, and with the proviso that not more than 1 of  $R^1$  or  $R^2$  is a hydrocarbon which is branched at the imino-bonded carbon atom;

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 $R^3$ ,  $R^4$ ,  $R^5$ , and  $R^6$  are independently hydrogen,  $C_{1-10}$  alkyl,  $C_{6-10}$  aryl,  $C_{7-15}$  aralkyl,  $C_{1-10}$  alkoxy, or  $C_{1-10}$  dialkylamino, each of these optionally substituted with halogen, cyano,  $C_{1-4}$  alkoxy, or  $C_{1-4}$  alkyl, or wherein any two adjacent  $R^3$  through  $R^6$  form a cyclic structure or are part of a larger ring structure, said cyclic structure and said larger ring structure optionally containing one or more heteroatoms, preferably  $R^6$ ,  $R^6$ 

L is a neutral or charged ligand; and

p is a integer such that complex I is neutral and the valency of M is satisfied.

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- The catalyst of claim 1 wherein M is a metal from Groups 8 to 10 of the Periodic Table.
- The catalyst of claim 1 wherein M is selected from the group consisting of nickel, palladium, iron, and cobalt.
- The catalyst of claim 1 wherein L is a charged ligand selected from the group consisting of unsubstituted and substituted cyclopentadienyl, indenyl, fluorenyl, hydride, halide, alkyl, aryl, aralkyl, dialkylamino, siloxy, alkoxy, pyrrolyl, indolyl, carbazoyl, quinolinyl, pyridinyl, azaborolinyl, boraaryl, and mixtures thereof.
- 5. The catalyst of claim 1 wherein L is a neutral ligand selected
   from the group consisting of carbonyl, η<sup>6</sup>-aryl, η<sup>4</sup>-butadiene, η<sup>4</sup>-cyclobutadiene,
   η<sup>4</sup>-cyclooctatetraene, tertiary phosphine, and mixtures thereof.
- 1 6. The catalyst of claim 1 wherein  $R^1$  and  $R^2$  are both hydrogen.
- The catalyst of claim 1 having formula II:

$$\begin{array}{c}
R^{9} \\
R^{7} \\
R^{10} \\
R^{10} \\
R^{11} \\
R^{12} \\
R^{14} \\
R^{14}
\end{array}$$
II

- 3 where
- M is a metal selected from Groups 3 to 10 of the Periodic Table;

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R<sup>1</sup> and R<sup>2</sup> are the same or different and are independently selected from hydrogen, C<sub>1-10</sub> alkyl, C<sub>6-10</sub> aryl, or C<sub>7-15</sub> aralkyl, each of these optionally substituted with halogen, cyano, C<sub>1-4</sub> alkoxy, or C<sub>1-4</sub> alkyl, and with the proviso that not more than 1 of R<sup>1</sup> or R<sup>2</sup> is a hydrocarbon which is branched at the imino-bonded carbon atom;  $R^7$ ,  $R^8$ ,  $R^9$ ,  $R^{10}$ ,  $R^{11}$ ,  $R^{12}$ ,  $R^{13}$ , and  $R^{14}$  are independently hydrogen,  $C_{1-10}$  alkyl,  $C_{6-10}$  aryl,  $C_{7-15}$  aralkyl,  $C_{1-10}$  alkoxy, or C<sub>1-10</sub> dialkylamino, each of these optionally substituted with halogen, cyano, C<sub>1-4</sub> alkoxy, or C<sub>1-4</sub> alkyl, or wherein any two of R7 through R14, or R10 and R11 form a cyclic structure or are part of a larger ring structure, said cyclic structure and said larger ring structure optionally containing one or more heteroatoms, preferably B, N, O, S, or P; L is a neutral or charged ligand; and p is a integer such that complex I is neutral and the valency of M is satisfied.

8. The catalyst of claim 1 further comprising an activator.

9. The catalyst of claim 8 wherein the activator is selected from the group consisting of alumoxanes, alkylaluminum compounds, and mixtures thereof.

- 10. The catalyst of claim 8 wherein the activator is an acid salt containing non-nucleophilic anions.
- 1 11. The catalyst of claim 8 wherein the activator is selected from 2 the group consisting of lithium tetrakis(pentafluorophenyl) borate, lithium 3 tetrakis(pentafluorophenyl) aluminate, anilinium tetrakis(pentafluorophenyl) borate, 4 and mixtures thereof.

1		12.	A process for coupling two or more olerns, the process
2	comprising:		
3		1)	introducing into a reaction vessel an activator and a catalyst
4			of claim 1 having formula I:

$$R^4$$
 $R^5$ 
 $R^6$ 
 $R^1$ 
 $N$ 
 $ML_p$ 
 $R^5$ 

where

M is a metal selected from Groups 3 to 10 of the Periodic Table;

 $R^1$  and  $R^2$  are the same or different and are independently selected from hydrogen,  $C_{1-10}$  alkyl,  $C_{6-10}$  aryl, or  $C_{7-15}$  aralkyl, each of these optionally substituted with halogen, cyano,  $C_{1-4}$  alkoxy, or  $C_{1-4}$  alkyl, and with the proviso that not more than 1 of  $R^1$  or  $R^2$  is a hydrocarbon which is branched at the imino-bonded carbon atom;

 $R^3$ ,  $R^4$ ,  $R^5$ , and  $R^6$  are independently hydrogen,  $C_{1-10}$  alkyl,  $C_{6-10}$  aryl,  $C_{7-15}$  aralkyl,  $C_{1-10}$  alkoxy, or  $C_{1-10}$  dialkylamino, each of these optionally substituted with halogen, cyano,  $C_{1-10}$  alkoxy, or  $C_{1-10}$  alkyl, or wherein any two adjacent  $R^3$  through  $R^6$  form a cyclic structure or are part of a larger ring structure, said cyclic structure and said larger ring structure optionally containing one or more heteroatoms, preferably B, N, O, S, or P;

L is a neutral or charged ligand; and p is a integer such that complex I is neutral and the valency of M is satisfied; and

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28 29	,	ast one olefin into the reaction vessel, to molecules of olefin are coupled together.	
1 2	13. The process of claim 12 wherein M is a metal from Group 8 to 10 of the Periodic Table.		
1 2	14. The process of claim 12 wherein M is selected from the group consisting of nickel, palladium, iron, and cobalt.		
1 2 3 4 5	15. The process of claim 12 wherein L is a charged ligand selected from the group consisting of unsubstituted and substituted cyclopentadienyl, indenyl, fluorenyl, hydride, halide, alkyl, aryl, aralkyl, dialkylamino, siloxy, alkoxy, pyrrolyl, indolyl, carbazoyl, quinolinyl, pyridinyl, azaborolinyl, boraaryl, and mixtures thereof.		
1 2 3	from the group consisting of carbonyl,	im 12 wherein L is a neutral ligand selected $\eta^6$ -aryl, $\eta^4$ -butadiene, $\eta^4$ -cyclobutadiene, and mixtures thereof.	
1 2 3	the group consisting of alumoxanes, a	im 12 wherein the activator is selected from alkylaluminum compounds, and mixtures	
1 2	•	aim 12 wherein the activator is an acid salt	
1 2 3 4	the group consisting of lithium tetres tetrakis(pentafluorophenyl) aluminate, an	im 12 wherein the activator is selected from rakis(pentafluorophenyl) borate, lithium ilinium tetrakis(pentafluorophenyl) borate,	

The process of claim 12 wherein said catalyst has the formula:

where

M is a metal selected from Groups 3 to 10 of the Periodic Table;

 $R^1$  and  $R^2$  are the same or different and are independently selected from hydrogen,  $C_{1-10}$  alkyl,  $C_{6-10}$  aryl, or  $C_{7-15}$  aralkyl, each of these optionally substituted with halogen, cyano,  $C_{1-4}$  alkoxy, or  $C_{1-4}$  alkyl, and with the proviso that not more than 1 of  $R^1$  or  $R^2$  is a hydrocarbon which is branched at the imino-bonded carbon atom;

 $R^3$ ,  $R^4$ ,  $R^5$ , and  $R^6$  are independently hydrogen,  $C_{1-10}$  alkyl,  $C_{6-10}$  aryl,  $C_{7-15}$  aralkyl,  $C_{1-10}$  alkoxy, or  $C_{1-10}$  dialkylamino, each of these optionally substituted with halogen, cyano,  $C_{1-4}$  alkoxy, or  $C_{1-4}$  alkyl, or wherein any two of  $R^7$  through  $R^{14}$ , or  $R^{10}$  and  $R^{11}$  form a cyclic structure or are part of a larger ring structure, said cyclic structure and said larger ring structure optionally containing one or more heteroatoms, preferably B, N, O, S, or P;

L is a neutral or charged ligand; and p is a integer such that complex I is neutral and the valency of M is satisfied.